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SCOPE FOR THE USE OF POLYAMINES IN SHELF LIFE OF SAPOTA

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ABSTRACT

Sapota is one of the fruits, which is highly perishable due to its quick ripening nature and faster senescence. To maintain and/or increase the shelf life of sapota, proper postharvest management is required. Unfortunately, very little work has been done so far, on shelf life enhancement of sapota. Different pre and postharvest treatments to reduce metabolic activity and quality loss have been suggested. Ripening of fruit is a mechanism, which involves a complex network of interacting genes and signaling pathways. Polyamines play very important role in ripening mechanism and post harvest management of fruits. They are organic compounds having two or more primary amino groups and are positively charged nitrogenous compounds derived from amino acids. (Adam and Murty,2013). This review describes how polyamines extend shelf life in fruits and their possible scope in sapota for the same.

KEYWORDS: Ripening of fruit, postharvest treatments.& polyamines extend

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INTRODUCTION

Sapota is a tropical fruits but can be grown under subtropical and temperate conditions. Plants are ever green in nature. The tree canopy has four kinds, viz, erect growing; with drooping branches, spreading branches with sweet fruits and spreading branches with inferior fruits. Sapota fruit is a rich source of Sugars (13-18%). Pulp contains sufficient quantity of minerals per 100 grams of pulp. Fully ripe fruits are eaten along with skin (epicarp). Sapota fruit ripening has been associated, with changes in endogenous levels of plant growth substance ethylene. Sapota is a climacteric fruit and is harvested at full maturity. Any technique or method which inhibits or reduces the ethylene evolution is regarded as being quite useful for extending the shelf life. Thus, use of polyamines can be an effective tool for delaying ripening and fruit softening by inhibiting activities of deteriorative enzymes.

Polyamines (PAs) are biological compounds of low molecular weight with aliphatic nitrogen groups present in living organisms, both animals and plants. The most common PAs are putrescine, spermidine and spermine. They are essential for cell growth and differentiation, and their intracellular concentrations increase during periods of rapid cell proliferation. PAs in their free forms have been reported to reduce senescence agents, from both endogenous and exogenous application, the main effects in fruits being retarded colour changes, increased fruit firmness, delayed ethylene and respiration rate emissions, induced mechanical resistance and reduced chilling symptoms (Valero, Martınez-Romero, Serrano, & Riquelme, 1999). In fruits, the main targets are cell wall pectic substances, resulting in changes in stability and physiological significance, as has been demonstrated by exogenous applications. In addition to the free forms, PA conjugates occur as both water soluble and insoluble forms covalently bound to negatively charged phospholipid components, or other anionic sites on membranes, thus altering the stability characteristics of these membranes (Slocum, Kaur-Sawhney, & Galston, 1984).

Polyamines in Fruit Ripening

Climacteric fruit, such as apple, apricot, avocado, banana, peach, plum, sapota etc., are characterised by their increased respiration and ethylene biosynthesis rates during ripening. Ethylene, an endogenous plant hormone is involved in ripening of fruits (Sisler, 1991), sharing common precursor s-adenosyl methionine (SAM) with polyamines, for their biosynthesis (Bouchereau et al., 1999), but having antagonistic functions in fruit ripening and senescence (Pandey et al., 2000), exogenous PAs application inhibits ethylene production (Apelbaum et al., 1982)

PAs have been determined to delay senescence, in a number of plant tissues by inhibiting ACC synthase biosynthesis (Davies et al., 1991), and modulate fruit ripening and senescence (Saftner and Baldi, 1990). Yet, the relationship between ethylene and polyamines is not clear and needs further research particularly in tropical fruits. Application of PUT (0.0, 1.0, 2.0 or 3.0 mM) on mango cv. Langra, significantly affected shelf life and quality attributes. PUT (2.0 mM) was found to be best concentration, which led to reduction in loss of physiological weight and percentage of spoilage, in comparison to the untreated fruits. Application of low concentration of SPM (0.5 mM) and higher concentration of PUT (1 mM) or SPD (1 mM) in mango cv. Kensington Pride were found effective, in reducing weight loss in comparison to untreated fruits under storage. In Mango application of SPM 0.5 mM helps in reduction in weight loss, decrease in softness, and decrease in respiration rate.

Exogenous application of PAs has revealed their potential, to retard fruit ripening process and extend the shelf life of fruit, with better quality. In apple exogenous application of PUT ($5x10^{-5}$M), exhibited higher TSS (Costa and Bagni, 1983). One of the main effects of infiltrated Pas, during post-harvest life of fruits and vegetables, is a net increase in firmness, such as has been shown in apples (Kramer, Wang, & Conway, 1991; Wang, Conway, Abbott, Kramer, & Sams, 1993), strawberry (Ponappa, Scheerens, & Miller, 1993), tomato (Law, Davies, & Mutschler, 1991), and lemon (Martınez-Romero et al., 1999), in which, the efficiency was generally greater for those molecules with higher number of available cations, that is SPM $^{4+}$> SPD $^{3+}$> PUT $^{2+}$. Spermidine and spermine are synthesized from putrescine, by the addition of aminopropyl groups.

CONCLUSIONS

The beneficial effects of the exogenous PAs in fruits are numerous, but the research on application of polyamines in sapota has not been done so far. Investigations have to be carried out to explore the potential use of polyamines in sapota, for extending shelf life. Prolonged shelf life and improved quality of polyamines treated fruits demonstrate its possible use to extend shelf life in sapota too. However, more work on this aspect has to be done in sapota, for confirmation of the same. We can hope for this investigation in the near future, to extract the polyamines use in sapota.

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